WHAT IS CLAIMED IS:

1. A magnet structure for Nuclear Magnetic Resonance imaging apparatus, comprising:

at least two opposing magnetic pole pieces located at a certain distance from each other and which delimit an imaging region;

wherein the pole pieces are formed by at least one massive layer of a magnetically permeable material, and at least one layer of magnetically permeable material comprising a pack of superimposed sheets or foils, electrically insulated from each other, each sheet having cuts arranged over the surface of the sheet in positions that are at least partly non coincident with the cuts of at least one, or both adjacent sheets, and

wherein each of the magnetically permeable sheets or foils comprises:

a first face; and

a second face; and

wherein the cuts arranged over the surface of the sheet or foil have a width and length and are so arranged on each sheet, that the cuts of a sheet or foil are offset and not coincident with respect to the cuts of an adjacent sheet or foil, when the adjacent sheet is laid over the previous sheet in an overturned position, with the first face turned toward the first face of the first sheet or with the second face of said adjacent sheet turned toward the second face of the first sheet.

2. A magnet structure as claimed in claim 1, wherein each sheet is divided into two halves along an axis parallel to or coincident with a sheet overturning axis, about which each successive sheet is overturned by 180° relative to the adjacent preceding sheet of the layer of sheets of each pole piece, there being provided an identical pattern of cuts for all sheets, which pattern differs in the arrangement, orientation, length, and/or width of the cuts in the two halves of each sheet such that, when two sheets are superimposed in a mutually overturned or reversed condition, with the first faces or the second faces of said two superposed sheets in contact with each other, the cuts of a sheet are disposed in offset positions with respect to the cuts of the overlying sheet in both halves of said adjacent sheets.

3. A magnet structure as claimed in claim 1, wherein the patterns of cuts on a sheet have a repeated, orderly, and/or recurring geometric cut arrangement, the cuts of the two halves of the sheet being formed according to the same arrangement pattern which, in the second half of the sheet, is offset to a certain extent in one or two directions subtending the plane formed by the sheet and/or angularly also in a possible direction of rotation or combination of said displacements, with respect to the periphery of second sheet half, relative to the position in the arrangement pattern of the first half of the sheet, such that the cuts of two superposed sheets, adhering by their first faces and their second faces, coincide with cut-free portions and/or have a small number of intersection points between the cuts of the two superposed sheets.

4. A magnet structure as claimed in claim 3, wherein when two adhering sheets are superimposed, one of the two sheets is overturned with respect to the other sheet, such that the first half and the second half of a sheet lie over the second half and the first half respectively of the other sheet and the cuts of said first and second halves of the one sheet are disposed coincident with the cut-free portions of said second and first halves of the underlying sheet and vice versa.

5. A magnet structure as claimed in claim 1, wherein the cuts are disposed along parallel axes which form a set of parallel axes, the sets of axes on the first and on the second half of the sheet being oriented parallel to each other and to an overturning axis, and there being provided a distance of the first axis of each set of axes from the center axis of the sheet, which is parallel to or coincident with the overturning axis, said distance being different for the sets of axes on the first half and on the second half of the sheet respectively.

6. A magnet structure as claimed in claim 5, wherein the cuts are continuous along the corresponding positioning axis of the set of parallel positioning axes.

7. A magnet structure as claimed in claim 5, wherein the cuts are discontinuous along the corresponding positioning axis of the set of parallel positioning axes and form whole regions or bridges of sheet material.

8. A magnet structure as claimed in claim 1, wherein the sets of cut positioning axes on the two halves of the sheet have an inclined, symmetrically divergent or convergent orientation, for the first and the second halves of the sheet with respect to the center axis of the sheet, which is parallel to or coincident with the sheet overturning axis, and wherein

the intersection points of the set of parallel positioning axes on the first half of the sheet with said center axis being provided in intermediate positions between the intersection points of the set of parallel positioning axes of the second sheet half of the sheet.

9. A magnet structure as claimed in claim 8, wherein the intersection points of the two sets of parallel cut positioning axis on the first and second halves of the sheet are interleaved and equally spaced along the center axis, which is parallel to or coincident with the overturning axis.

10. A magnet structure as claimed in claim 1, wherein the sets of cut positioning axes on the two halves of the sheet have an inclined orientation with respect to the center axis of the sheet, which is parallel to or coincident with the sheet overturning axis, the intersection points between the set of parallel positioning axes on the first half of the sheet and said center axis being situated in intermediate positions with respect to the intersection points between the positioning axes of the set of parallel positioning axis of the second half of the sheet and said center axis, and each cut along each positioning axis being discontinuous and forming an unbroken portion of the sheet, the succession of the unbroken sheet portions and of the cut parts along the positioning axes being inverted from the first half to the second half of the sheet, whereas the pitch of the cuts and unbroken portions along each positioning axis is such that, when the first half of the sheet is overturned against the second half of the

sheet, the cuts of the first half of the sheet intersect along each positioning axis the cuts of the second half of the sheet at unbroken portions, and vice versa.

11. A magnet structure as claimed in claim 1, wherein on each sheet half, the cuts are arranged along two intersecting sets of parallel positioning axes, an unbroken portion of the sheet or a bridge of material being provided at each intersection point between each axis of one set of axes, and each axis of the other set of axes, and the two sets of intersecting parallel positioning axes being offset in the second half of the sheet relative to the corresponding set of the first half of the sheet, such that, when the second half of the sheet is overturned on the first half of the sheet about a center axis parallel to the overturning axis or coincident therewith, the unbroken intersection portions of the cuts along intersecting sets of parallel positioning axis of one half of the sheet fall within portions of the sheet of the other half of the sheet, which are delimited by the cuts.

12. A magnet structure as claimed in claim 11, wherein the intersecting sets of positioning axes have axes inclined with respect to the overturning axis, in the same orientation for the two sheet halves or with different, symmetrical orientations with respect to a center axis parallel to and/or coincident with the overturning axis.

13. A structure as claimed in claim 11, wherein one set of parallel cut positioning axes on both sheet halves is parallel to the overturning axis.

14. A structure as claimed in claim 11, wherein one set of parallel cut positioning axes on both sheet halves is perpendicular to the overturning axis.

15. A structure as claimed in one or more of the preceding claims 11, wherein on at least one half of the sheet, the two intersecting sets of positioning axes are disposed in such a manner that the unbroken sheet portions between cuts along the axes of a first set are situated in intermediate positions between two positioning axes of the second set, whereas the cuts of the first set intersect the axes of the second set coincident with the unbroken portions along the axes of said second set.

16. A structure as claimed in claim 1, wherein the cuts are disposed along positioning axes in radial arrangements from a defined center of the sheet, an identical angular distance being provided between individual radial lines along which cuts are provided, whereas a portion of said radial arrangement of cuts being provided on each of the two sheet halves, the portion of radial cuts of the second sheet half being rotated with respect to the portion of the radial cuts of the first sheet half, with reference to said center, to such an extent that when the second half of the sheet is overturned on the first half of the sheet, the cuts of one of the two halves are in intermediate positions between the cuts of the other half.

17. A magnet structure as claimed in claim 16, wherein the center of the radial arrangement of cuts is the same for both halves of the sheet and is coincident with a center axis, parallel to or coincident with the overturning axis and/or the geometric center of the sheet.

18. A magnet structure as claimed in claim 16, wherein the radial cuts on the sheet are combined with a peripheral ring of cuts, which is interleaved with the former, the cuts of the peripheral ring being also disposed on the first and second halves of the sheet and the cuts of the second sheet half being angularly shifted with respect to those of the first sheet half, like the radial cuts.

19. A magnet structure as claimed in claim 16, wherein each sheet is composed of at least two adjacent sheet parts, separated by a parting line, said parting line being provided in eccentric position and/or orientation with respect to the center axis parallel to or coincident with the overturning axis, and anyway in such position and/or orientation that the parting lines between the parts of two superimposed sheets do not coincide, and intersection points therebetween are avoided or minimized.

20. A magnet structure as claimed in claim 19, wherein the parting line between the two or more parts of the sheet extends in a cut-free portion, so that said parting

line does not intersect any cut on the sheet and/or possibly any cut on one or two adjacent sheets.

21. A magnet structure as claimed in claim 19, wherein the parting line is a polygonal line, a toothed line with square, triangular or trapezoidal teeth, a curved line, or a combination of said lines.

22. A magnet structure as claimed in claim 19, wherein the parting line is a polygonal line having transverse branches and divides a sheet into four separate parts.

23. A magnet structure as claimed in claim 19, wherein the sheets and/or the sheet parts have holes at predetermined coincident positions for engagement on alignment and centering pins during the assembly of the pack of sheets.

24. A method for making a magnet structure for Nuclear Magnetic Resonance imaging apparatus, which magnet structure has at least two opposing magnetic pole pieces, which are located at a certain distance from each other and delimit an imaging region, which pole pieces are formed by at least one massive layer of a magnetically permeable material, and at least one layer of magnetically permeable material comprising a pack of superimposed sheets or foils, electrically insulated from each other, each of which sheets has an upper face and a rear face with respect to the massive layer and each of which sheets has cuts arranged over the surface of the sheet in positions that are at least partly non coincident with the cuts of at least one, or both adjacent sheets ,

wherein the cuts are formed on each sheet with such a pattern of cuts that the cuts of an overlying sheet or foil are disposed in offset and not coincident positions with respect to the cuts of the underlying sheet, when said overlying sheet is laid over the preceding sheet in a reversed position, i.e. with the front face overturned against the preceding sheet, the pack of sheets being formed by the alternate disposition of said sheets in a normal position, with the upper face turned toward the massive layer and the sheets in the overturned position.

25. A method as claimed in claim 24, further comprising the step of

dividing the surface of the sheets into two halves, cuts being formed on one sheet half in a first pattern, and cuts being formed on the second half of the sheet in a pattern related to the pattern of cuts on the first sheet, in such a manner that when the second half of the sheet is overturned against the first half of the sheet, the cuts of the two halves of the sheet are disposed in non coincident positions and/or such as to avoid or minimize intersections, the pack of sheets being formed by identical sheets all having the same patterns of cuts on the corresponding first and second halves of the sheets and said sheets being alternately superimposed with a first face turned toward the massive layer and with said first face turned in the direction opposite the massive layer of the pole piece.

26. A method for making a magnet structure for Nuclear Magnetic Resonance imaging apparatus, which magnet structure has at least two opposing magnetic pole pieces, which are located at a certain distance from each other and delimit an imaging region, which pole pieces are formed by at least one massive layer of a magnetically permeable material, and at least one layer of magnetically permeable material comprising a pack of superimposed sheets or foils, electrically insulated from each other, each of which sheets has an upper face and a rear face with respect to the massive layer and each of which sheets has cuts arranged over the surface of the sheet in positions that are at least partly non coincident with the cuts of at least one, or both adjacent sheets ,

wherein the cuts are formed on each sheet with such a pattern of cuts that the cuts of an overlying sheet or foil are disposed in offset and not coincident positions with respect to the cuts of the underlying sheet, when said overlying sheet is laid over the preceding sheet in a reversed position, i.e. with the front face overturned against the preceding sheet, the pack of sheets being formed by the alternate disposition of said sheets in a normal position, with the upper face turned toward the massive layer and the sheets in the overturned position., further comprising the step of forming a pattern of cuts as claimed in claim 3.

27. A method as claimed in claim 24, further comprising the step of interposing a film between two adjacent sheets and/or of coating each sheet with an insulating and/or adhesive material, or of coating at least one face of each sheet with a layer of an insulating and/or adhesive material before superimposing the sheets of the pack of sheets being formed.

28. A method as claimed in claim 27, wherein the pack of sheets with interposed insulating and/or adhesive layers, is pressed under heat or at ambient temperature.

29. A method as claimed in claim 27, wherein a thermosetting adhesive film is interposed between the sheets or at least one face of the sheets is coated with said thermosetting adhesive, the pack being hot and vacuum pressed.

30. A method as claimed in claim 29, wherein the layer of thermosetting adhesive consists of a compound used for making printed circuit boards, known as vetronite or preprag.

31. A method as claimed in claim 24, wherein each sheet is composed of at least two separate sheet parts, the parting line between said at least two sheet parts being provided in eccentric position and/or orientation with respect to the center axis parallel to or coincident with the overturning axis, and anyway in such position and/or orientation that the parting lines between the parts of two superimposed sheets do not coincide, and intersection points therebetween are avoided or minimized.

32. A method as claimed in claim 24, wherein each sheet is formed by three or more sheet parts, the parting line being a polygonal line with lateral branches, which extends so that the parting lines of two superposed sheets, one whereof is overturned, are not superposed and do not intersect, or intersect in a minimized number of points.

33. A magnet structure as claimed in claim 24, wherein the parting lines are at least partly a polygonal line, a toothed line with square, triangular or trapezoidal teeth, a curved line, or a combination of said lines.

34. A method as claimed in claim 24, wherein the parting lines are situated in regions without cuts.

35. A magnet structure for Nuclear Magnetic Resonance imaging apparatus, which magnet structure has at least two opposing magnetic pole pieces, which are located at a certain distance from each other and delimit an imaging region, which pole pieces are formed by at least one massive layer of a magnetically permeable material, and at least one layer of magnetically permeable material comprising a pack of superimposed sheets or foils, electrically insulated from each other, each of which sheets has cuts arranged over the surface of the sheet in positions that are at least partly non coincident with the cuts of at least one, or both adjacent sheets,

wherein at least two different kinds of magnetically permeable sheets or foils are provided which have passing cuts distributes on their surface area according to an identical pattern of cuts and the pattern of cuts on a first kind of sheets is provided on the said first kind of sheets in a shifted position with respect to the position of the same pattern of cuts provided on the second kind of sheets, according to two directions which are transverse one with respect to the other, particularly orthogonal one to the other and which are parallel to the plane defined by the sheets in such a way that by superimposing a sheet of the first kind on a sheet of the second kind, the cuts of the pattern of the two kind of sheets will not coincide.

36. A magnet structure according to claim 35, wherein a sequence of N different kind sheets with N being integer is provided each one kind of sheets having an identical pattern of cuts which for each one kind of the N kind of sheets is displaced for a given distance along the same two directions relatively to the preceding kind of sheet in the sequence of the N kind of sheets.

37. A magnet structure according to claim 36, wherein the number N of different kinds of sheets is a rational fraction of the total number of sheets in a pack of sheets and the pack of sheets is formed by an alternate superimposing of the N different kind of sheets in the pack corresponding to a recursive superimposing of the sequence of sheets.

38. A magnet structure according to claim 36, wherein the number of the different kind of sheets N is equal to the total number of sheets provided in the pack of sheets so that non repetition of the sequence of the N different kind of sheets is needed for forming the pack of sheets.

39. A magnet structure according to claim 1, wherein the sheets have non rotational symmetry.

40. A magnet structure according to claim 1, wherein the sheets have rotational symmetry.

41. A magnet structure according to claim 1, wherein the sheets are provided with one, two or more centering through holes which are distributed over the surface area of the sheets according to a pattern which is identical for each sheet and which patter has the same position on each sheet in such a way that superimposing the sheets for forming a pack of sheets the centering holes are coincident.

42. A magnet structure according to claim 1, wherein the sheets have identical shape and dimensions.

43. A magnet structure according to claim 1, wherein the pattern of cuts is formed by rectangular concentric ideal paths along which paths several cuts are provided at a certain distance one from the other for forming material bridges between the sheet zones inside a rectangular path and outside the said rectangular path.

44. A magnet structure according to claim 1 wherein the pattern of cuts provides cuts having orientations parallel to both the two directions of displacement of the pattern of cuts between two different kinds of sheets and also cuts oriented along paths having at an angle of 45°, 135°,225°, or 315° with respect to the said two orthogonal directions of displacement.

45. A method for making a magnet structure for Nuclear Magnetic Resonance imaging apparatus, which magnet structure has at least two opposing magnetic pole pieces, which are located at a certain distance from each other and delimit an imaging region, which pole pieces are formed by at least one massive layer of a magnetically permeable material, and at least one layer of magnetically permeable material comprising a pack of superimposed sheets or foils, electrically insulated from each other, each of which sheets has cuts arranged over the surface of the sheet in positions that are at least partly non coincident with the cuts of at least one, or both adjacent sheets, the method comprising:

providing at least two different kinds of magnetically permeable sheets or foils providing the two kinds of sheets with passing cuts distributed on their surface area according to an identical pattern of cuts and

the said pattern of cuts on a first kind of sheets being in a shifted position with respect to the position of the same pattern of cuts provided on the second kind of sheets, according to two directions which are transverse one with respect to the other, particularly orthogonal one to the other and which are parallel to the plane defined by the sheets in such a way that by superimposing a sheet of the first kind on a sheet of the second kind, the cuts of the pattern of the two kind of sheets will not coincide.

46. A method according to claim 45, wherein N different kind of sheets are provided the N kind of sheets being part of a sequence of different kind of sheets obtained by stepwise shifting an identical pattern of cuts of one kind of sheet of the sequence relatively to the previous kind of sheet of the sequence and providing the said kind of sheet with discontinuous cuts along the said pattern.

47. A method for making a magnet structure for Nuclear Magnetic Resonance imaging apparatus, which magnet structure has at least two opposing magnetic pole pieces, which are located at a certain distance from each other and delimit an imaging region, which pole pieces are formed by at least one massive layer of a magnetically permeable material, and at least one layer of magnetically permeable material comprising a pack of superimposed sheets or foils, electrically insulated from each other, each of which sheets has cuts arranged over the surface of the sheet in positions that are at least partly non coincident with the cuts of at least one, or both adjacent sheets, the method comprising:

providing at least two different kinds of magnetically permeable sheets or foils providing the two kinds of sheets with passing cuts distributed on their surface area according to an identical pattern of cuts and

the said pattern of cuts on a first kind of sheets being in a shifted position with respect to the position of the same pattern of cuts provided on the second kind of sheets, according to two directions which are transverse one with respect to the other, particularly orthogonal one to the other and which are parallel to the plane defined by the sheets in such a way that by superimposing a sheet of the first kind on a sheet of the second kind, the cuts of the pattern of the two kind of sheets will not coincide, wherein it provides the steps of claim 27.